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PATENT  
Customer No. 22,852  
Attorney Docket No. 04329.3238

**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of: )  
)  
Gaku MINAMIHABA et al. ) Group Art Unit: 2818  
)  
Application No. 10/771,060 ) Examiner: Goodwin, David J.  
)  
Filed: February 4, 2004 ) Confirmation No. 2231  
)  
For: POLISHING PAD AND METHOD )  
OF MANUFACTURING )  
SEMICONDUCTOR DEVICES )

**Mail Stop Appeal Brief--Patents**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**TRANSMITTAL OF APPEAL BRIEF (37 C.F.R. 41.37)**

Transmitted herewith is the APPEAL BRIEF in this application with respect to the  
Notice of Appeal filed on August 8, 2008.

This application is on behalf of

☐ Small Entity ☒ Large Entity

Pursuant to 37 C.F.R. 41.20(b)(2), the fee for filing the Appeal Brief is:

☐ \$270.00 (Small Entity)

☒ \$540.00 (Large Entity)

**TOTAL FEE DUE:**


Appeal Brief Fee	\$540.00
Extension Fee (if any)	\$0.00
Total Fee Due	\$540.00

☒ The fee total of \$540.00 is submitted herewith.

PETITION FOR EXTENSION. If any extension of time is necessary for the filing of this Appeal Brief, and such extension has not otherwise been requested, such an extension is hereby requested, and the Commissioner is authorized to charge necessary fees for such an extension to Deposit Account 06-0916.

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

Dated: October 8, 2008

By:   
Brandon B. Crisp  
Reg. No. 63,138



PATENT  
Customer No. 22,852  
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
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OF MANUFACTURING	)	
SEMICONDUCTOR DEVICES	)	

**Attention: Mail Stop Appeal Brief-Patents**  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**APPEAL BRIEF UNDER BOARD RULE § 41.37**

In support of the Notice of Appeal filed August 8, 2008, and further to Board Rule 41.37, Appellants present this brief and enclose herewith the fee of \$540.00 required under 37 C.F.R. § 1.17(c).

This Appeal responds to the March 10, 2008, final rejection of claims 11-18 and 20.

If any additional fees are required or if the enclosed payment is insufficient, Appellant requests that the required fees be charged to Deposit Account 06-0916.

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**Real Party In Interest**

JSR Corporation is the real party in interest.

**Related Appeals and Interferences**

There are currently no other appeals or interferences, of which Appellants, Appellants' legal representative, or Assignee are aware, that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**Status Of Claims**

Claims 1-10 are withdrawn from consideration. Claims 11-18 and 20 stand rejected. Claim 19 was previously cancelled by Appellants. Appellants appeal the rejection of claims 11-18 and 20.

**Status Of Amendments**

Appellants filed an Amendment after Final on June 10, 2008. The Examiner indicated in an Advisory Action mailed July 15, 2008, that the Amendment after Final filed June 10, 2008, would be entered for purposes of appeal.

**Summary Of Claimed Subject Matter**

**Independent Claim 11**

Independent claim 11 recites a method of manufacturing a semiconductor device that comprises forming a treating film above a semiconductor substrate and subjecting the treating film to a polishing treatment using a polishing pad disposed on a turntable. During the polishing treatment, slurry containing abrasive grain is fed onto the treating film. Specification, p. 6, lines 8-15. The polishing pad has a compression elastic modulus ranging from 300 to 600 MPa and comprises a matrix, and cells and/or a recessed portion-forming material both having an average diameter ranging from 0.05 to 290  $\mu\text{m}$ , dispersed in the matrix, and occupying a region ranging from 0.1% by volume to 5% by volume based on an entire volume of the pad. *Id.* at p. 6, lines 15-18, and p. 26, lines 3-8. The matrix has a major surface which faces the treating film and has a roughness of 5  $\mu\text{m}$  or less. *Id.* at p. 6, lines 20-22.

**Grounds of Rejection**

A. Claims 11 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shimagaki et al., U.S. Pat. No. 6,953,388 ("Shimagaki") in view of Burke, U.S. Pat. App. Pub. No. 2002/0098789 ("Burke") and Saka et al., U.S. Pat. No. 6,458,013 ("Saka").

B. Claims 12-16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shimagaki in view of Burke, Saka, and You et al., U.S. Patent No. 6,663,787 ("You").

C. Claims 17 and 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shimagaki in view of Burke, Saka, and Jang et al., U.S. Patent No. 5,702,977 ("Jang").

**Argument**

**I. Rejection of Claims 11 and 20**

Appellants respectfully request withdrawal of the rejection of claims 11 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Shimagaki in view of Burke and Saka.

Neither Shimagaki nor Burke, nor their combination, discloses or suggests Appellants' claimed invention as recited in independent claim 11. This is at least because, as the Examiner admitted, "Shimagaki in view of Burke does not teach the compression [elastic] modulus of the pad." Final Office Action at 3.

The Examiner relied on Saka to overcome the deficiencies of Shimagaki and Burke, and alleged that "Saka teaches a polishing pad having a compression elastic modulus of between 300 and 600 [MPa]." Final Office Action 4. Appellants respectfully disagree. Saka discloses use of a Rodel IC1400 commercial composite pad, consisting of two layers -- namely, "a micro porous polyurethane top layer (Rodel IC1000) and a high density urethane foam as underlayer." Saka, col. 11, lines 54-60, emphasis added. Saka discloses that the room temperature elastic modulus of the top pad (*i.e.*, the Rodel IC1000) is 500 MPa, but the room temperature elastic modulus of the composite pad (*i.e.*, the Rodel IC1400) is 60 MPa. *Id.* Saka discloses use of the composite pad, and not solely the top pad, in polishing experiments. Thus, the elastic modulus of the pad used by Saka for polishing experiments, *i.e.*, the composite pad, is 60 MPa, which is well outside the claimed range of 300 to 600 MPa for the compression elastic modulus, as required in independent claim 11. For at least this reason, Saka does not disclose or



suggest the claimed “polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,” as recited in independent claim 11.

Further, Saka does not disclose or suggest “subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable,” as also recited in independent claim 11. The polishing pad of Saka is not disposed on a turntable. Instead, Saka’s polishing pad is a composite pad (Rodel IC1400), containing a top layer (Rodel IC1000 pad) disposed on a high-density urethane foam underlayer. See Saka, col. 11, lines 54-60. Thus, Saka’s top layer, the Rodel IC1000 pad, which the Examiner relies on for its room temperature elastic modulus of 500 MPa, is disposed on an underlayer, and not on a turntable. *Id.*

Saka also does not disclose or suggest “the range of the compression elastic modulus of the polishing pad on the turntable is satisfied,” as recited in independent claim 11. Saka’s composite pad has a modulus of only 60 MPa and thus fails to satisfy Appellants’ claimed range. Further, Saka’s top layer (Rodel IC1000), although it has a modulus of 500 MPa, is not disposed on the turntable. Thus, the mere disclosure of a top layer with a modulus of 500 MPa by Saka is not sufficient to disclose or suggest Appellants’ claimed invention as recited in independent claim 11.

Moreover, during a telephonic interview conducted on May 9, 2008, the Examiner appeared to suggest that since Saka discloses the use of the Rodel IC1000 as a hard pad, then it would have been obvious to one of ordinary skill in the art the time of the invention to use such a hard pad. Appellants respectfully disagree. Even if one of ordinary skill in the art at the time of the invention had considered modifying Saka to use only a hard pad, such as the Rodel IC1000, and not a composite pad as disclosed by

Saka, one still would not have achieved Appellants' claimed invention. As Appellants point out in their specification, the Rodel IC1000 is a conventional hard polishing pad, containing a volume of voids or solid material higher than 5% by volume based on the entire volume of the matrix of the polishing pad. See Specification, page 4, lines 18-26. Independent claim 11 clearly requires that "cells and/or a recessed portion-forming material ... occupy[] a region ranging from 0.1% by volume to 5% by volume based on an entire volume of said pad" (emphasis added). Thus, the Rodel IC1000, does not meet the requirements of independent claim 11.

In addition, Appellants disclose in their specification that a Rodel IC1000 pad was compared to a pad according to the present invention, and that

while the number of scratches on the ... stopper film 201 was 88/wafer when then IC1000 was employed, the number of scratches was reduced to 2/wafer when the polishing pad No. 35 was employed. It was confirmed from these facts that it was possible to greatly minimize the generation of scratch in the polishing process by using the polishing pads according to the embodiments of the present invention,

Specification, page 36, lines 3-14.

In the Advisory Action mailed July 15, 2008, the Examiner asserted that "[a]lthough additional substrate[s] may affect the overall modulus, said additional substrata will not change the elastic modulus of the layer" and that "applicant has not, in the claim, precluded additional substrata." Advisory Action, Continuation Sheet, page 2. The Examiner then concluded that "such additional substrata or lack thereof will not distinguish the application from the prior art." *Id.* Appellants respectfully disagree. As established above, Saka does not disclose or suggest "a polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression

elastic modulus ranging from 300 to 600 MPa,” as recited in independent claim 11.

Saka's top layer is disposed on a foam underlayer, and it is only the foam underlayer that is disposed on a turntable. Saka, col. 11, lines 54-60. As also established above, Saka's foam underlayer results in Saka's composite pad having an elastic modulus of 60 MPa, which is far outside the claimed range of 300 to 600 MPa recited in independent claim 11. While a foam underlayer may not change the elastic modulus of the top layer, Saka's inclusion of a foam layer clearly changes the elastic modulus of the composite pad. Saka appears to be directed to the use of a composite pad, not merely a top layer such as a Rodel IC1000. Thus, contrary to the Examiner's assertions, the inclusion of a foam underlayer by Saka as an additional layer clearly is a distinction between Saka and Appellants' claimed invention.

Further, in the Advisory Action, the Examiner asserted that “the rejection relied upon Shimigaki to teach disposing a polishing pad on a turntable” and that “it is considered very obvious to dispose a polishing pad on a turntable.” Advisory Action, Continuation Sheet, page 2. Appellants submit, however, that Shimigaki does not obviate Saka's apparently necessary use of a foam underlayer, or the requirement that Saka's foam underlayer, and not Saka's top layer, be in contact with a turntable. Shimagaki therefore does not overcome the deficiencies of Saka, at least for this reason.

For at least these reasons, Saka, whether considered alone or modified by any knowledge of hard pads that one of ordinary skill in the art may arguably have possessed at the time of the invention, still fails to disclose or suggest each and every element of Appellants' claimed invention, as recited in independent claim 11. Also, at

least for these reasons, Saka fails to overcome the deficiencies of Shimagaki and Burke. Therefore, Shimagaki, Burke, and Saka, whether taken separately or in any combination, fail to disclose or suggest Appellants' claimed invention, as recited in independent claim 11. Independent claim 11 should therefore be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. Claim 20 should also be allowable over Shimagaki, Burke, and Saka, at least due to its dependence from base claim 11. Appellants therefore respectfully request withdrawal of the rejection of claims 11 and 20.

## **II. Rejection of Claims 12-16**

Appellants respectfully request withdrawal of the rejection of claims 12-16. Appellants have established above that independent claim 11 should be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. Claims 12-16 should also each be allowable over Shimagaki, Burke, and Saka, at least due to their dependence from base claim 11.

The Examiner cited You for its alleged disclosure of a copper damascene method; using copper as a conductive layer to be polished; and using silicon nitride and polyaryl ether as the second and first layers, respectively. Final Office Action at 5. Appellants submit that You discloses "[a] method of manufacturing [a] semiconductor device" including "a first metallization level, a first diffusion barrier layer, a first etch stop layer, a dielectric layer and an opening extending through the dielectric layer, the first etch stop layer, and the first diffusion barrier layer." You, Abstract. However, You fails to disclose or suggest Appellants' claimed invention, at least because You does not disclose or suggest

“[a] method of manufacturing a semiconductor device, comprising: ... subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,”

as recited in independent claim 11. Instead, You's disclosure is directed to “address[ing] and solv[ing] the problem of contamination during single damascene processing from copper being deposited onto a silicon oxide dielectric layer as a result of reverse physical sputtering.” You, col. 12, line 66 through col. 13, line 2. You is also directed to “address[ing] problems associated with the high capacitance of inter-metal dielectric layers.” *Id.*, col. 13, lines 18-20. You's only references to chemical mechanical planarization (CMP) are directed merely to removing excess conductive material, with no further disclosure regarding CMP being given or suggested. See, e.g., col. 1, lines 58-61. You does not disclose or suggest the claimed “polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,” as recited in independent claim 11.

For at least these reasons, You fails to disclose or suggest Appellants' claimed invention, as recited in independent claim 11. Also, for at least this reason, You fails to overcome the deficiencies of Shimagaki, Burke, and Saka. Therefore, Shimagaki, Burke, Saka, and You, whether taken separately or in any combination, fail to disclose or suggest Appellants' claimed invention, as recited in independent claim 11. Independent claim 11 should therefore be allowable over Shimagaki, Burke, Saka, and You, whether taken separately or in any combination. Claims 12-16 should also be allowable over Shimagaki, Burke, Saka, and You, at least due to their respective

dependence from base claim 11. Appellants therefore respectfully request withdrawal of the rejection of claims 12-16.

### III. Rejection of Claims 17 and 18

Appellants respectfully request withdrawal of the rejection of claims 17 and 18. As established above, independent claim 11, and claims 17 and 18, which depend from claim 11, should all be allowable over Shimagaki, Burke, and Saka, whether taken separately or in any combination. The Examiner applied Jang in an attempt to overcome the deficiencies of Shimagaki, Burke, and Saka. Jang discloses “[a] method for forming within a trench within a substrate within an integrated circuit a planarized trench fill layer.” Jang, Abstract. Jang’s disclosure regarding chemical mechanical polishing (CMP) is limited to planarizing the trench fill layer and avoiding the formation of a dish. See, e.g., Abstract. However, Jang does not disclose or suggest

“[a] method of manufacturing a semiconductor device, comprising: ... subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable ... said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,”

as recited in independent claim 11. Jang contains no disclosure or suggestion of any properties of a polishing pad, and certainly does not disclose or suggest the claimed “polishing pad having a compression elastic modulus ranging from 300 to 600 MPa,” as recited in independent claim 11.

For at least this reason, Jang fails to disclose or suggest Appellants’ claimed invention, as recited in independent claim 11. Also, for at least this reason, Jang fails to overcome the deficiencies of Shimagaki, Burke, and Saka. Therefore, Shimagaki, Burke, Saka, and Jang, whether taken separately or in any combination, fail to disclose

or suggest Appellants' claimed invention, as recited in independent claim 11.

Independent claim 11 should therefore be allowable over Shimagaki, Burke, Saka, and Jang, whether taken separately or in any combination. Claims 17 and 18 should also be allowable over Shimagaki, Burke, Saka, and Jang, at least due to their dependence from base claim 11. Appellants therefore respectfully request withdrawal of the rejection of claims 17 and 18.

### **Conclusion**


For the reasons given above, pending claims 11-18 and 20 are allowable and reversal of the Examiner's rejection is respectfully requested.

To the extent any extension of time under 37 C.F.R. § 1.136 is required to obtain entry of this Appeal Brief, such extension is hereby respectfully requested. If there are any fees due under 37 C.F.R. §§ 1.16 or 1.17 which are not enclosed herewith, including any fees required for an extension of time under 37 C.F.R. § 1.136, please charge such fees to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

Dated: October 8, 2008

By:   
Brandon B. Crisp  
Reg. No. 63,138

**Claims Appendix to Appeal Brief Under Rule 41.37(c)(1)(viii)**

1. (Withdrawn) A CMP pad which is abrasive-free and comprises:  
  
cells and/or a recessed portion-forming material both having an average diameter ranging from 0.05 to 290  $\mu\text{m}$  and occupying a region ranging from 0.1% by volume to 5% by volume based on an entire volume of said pad; and  
  
an organic material.
2. (Withdrawn) The CMP pad according to claim 1, wherein said CMP pad has a compression elastic modulus ranging from 100 to 600 MPa.
3. (Withdrawn) The CMP pad according to claim 1, wherein said CMP pad has a compression elastic modulus ranging from 300 to 600 MPa.
4. (Withdrawn) The CMP pad according to claim 1, wherein said region ranges from 1% by volume to 4% by volume based on an entire volume of said pad.
5. (Withdrawn) The CMP pad according to claim 1, wherein said cells and/or a recessed portion-forming material respectively has an average diameter ranging from 1 to 100  $\mu\text{m}$ .
6. (Withdrawn) The CMP pad according to claim 1, wherein said organic material comprises at least one selected from the group consisting of 1,2-polybutadiene resin, ethylene-vinyl acetate copolymer, polyethylene, polyester resin, diene elastomer, polyolefin elastomer, styrene type block copolymer-based elastomer, thermoplastic polyurethane-based elastomer, conjugated diene-based rubber, ethylene- $\alpha$ -olefin-based rubber and urethane resin.
7. (Withdrawn) The CMP pad according to claim 1, wherein said recessed portion-forming material is a water soluble solid material.



8. (Withdrawn) The CMP pad according to claim 7, wherein said water soluble solid material is an organic water soluble solid material.

9. (Withdrawn) The CMP pad according to claim 8, wherein said organic water soluble solid material is formed of at least one selected from a group consisting of dextrin and cyclodextrin.

10. (Withdrawn) The CMP pad according to claim 7, wherein said water soluble solid material is an inorganic water soluble solid material.

11. (Previously Presented) A method of manufacturing a semiconductor device, comprising:

forming a treating film above a semiconductor substrate; and

subjecting said treating film to a polishing treatment using a polishing pad disposed on a turntable while feeding a slurry containing abrasive grain onto said treating film, said polishing pad having a compression elastic modulus ranging from 300 to 600 MPa and comprising a matrix, and cells and/or a recessed portion-forming material both having an average diameter ranging from 0.05 to 290  $\mu\text{m}$ , dispersed in said matrix, and occupying a region ranging from 0.1% by volume to 5% by volume based on an entire volume of said pad, said matrix having a major surface which faces said treating film and having a roughness of 5  $\mu\text{m}$  or less, wherein the range of the compression elastic modulus of the polishing pad on the turntable is satisfied.

12. (Original) The method according to claim 11, wherein said treating film is a conductive film deposited on an insulating film having a recessed portion and deposited above said semiconductor substrate, said treating film being subsequently subjected to said polishing treatment to form a wiring layer which is buried in said recessed portion.

13. (Original) The method according to claim 12, wherein said conductive film includes Cu film.

14. (Original) The method according to claim 12, wherein said insulating film is formed by a process wherein a first insulating film having a relative dielectric constant of less than 2.5 is formed at first, and then, a second insulating film having a higher relative dielectric constant than that of said first insulating film is deposited on said first insulating film.

15. (Original) The method according to claim 14, wherein said first insulating film is formed of a material selected from the group consisting of polysiloxane, hydrogen silsesquioxane, polymethylsiloxane, methylsilsesquioxane, polyarylene ether, polybenzoxazole, polybenzocyclobutene and a porous silica film.

16. (Original) The method according to claim 14, wherein said second insulating film is formed of a material selected from the group consisting of SiC, SiCH, SiCN, SiOC, SiN and SiOCH.

17. (Original) The method according to claim 11, further comprises forming a trench on said semiconductor substrate prior to the forming of said treating film above said semiconductor substrate; said treating film being an insulating film deposited above said semiconductor substrate and subsequently subjected to said polishing treatment to form a pattern of the insulating film which is buried in said trench.

18. (Original) The method according to claim 17, wherein said insulating film is formed of a material selected from the group consisting of SiO<sub>2</sub> and organic SOG.

19. (Cancelled)

20. (Original) The method according to claim 11, wherein said recessed portion-forming material is formed of a water soluble solid material eluting from said matrix to form recessed portions on a surface of said polishing pad during said polishing treatment.

**Evidence Appendix to Appeal Brief Under Rule 41.37(c)(1)(ix)**

No evidence is being relied upon by Appellants in the appeal.

**Related Proceedings Appendix to Appeal Brief Under Rule 41.37(c)(1)(x)**

There are no related proceedings to this Appeal.